

REMARKS

Applicants respectfully request reconsideration of the present application in view of the reasons that follow. A detailed listing of all claims that are, or were, in the application, irrespective of whether the claim(s) remain under examination in the application, is presented, with an appropriate defined status identifier. Claims 1-4, 6, 8-13, 15-20, 22, and 23 are now pending in this application.

Rejections Under 35 U.S.C. § 102

In the Office Action, Claims 1-3, 6, 10, 15, 17-20 and 22 are rejected under 35 U.S.C. § 102(e) as anticipated by U.S. Patent No. 6,399,496 (Edelstein et al.) as supported by U.S. Patent 6,749,689 (Bögel et al.). Applicants respectfully traverse the rejection.

Independent Claim 1 requires:

the copper alloy material including Zinc (Zn) or Silver (Ag) and at least one element for increasing grain size including Calcium (Ca) or Chromium (Cr).

Independent claims 10 and 17 require:

the ternary copper alloy via material includes an element with a characteristic for increasing grain size of the ternary copper alloy via,

Contrary to what the Examiner states in the Office Action, Edelstein et al. does not mention grain size at all. Edelstein et al. describes the use of “seed layers.” The section referred to by the Examiner in the Office Action – Col. 8, lines 35-52 – states that seed layers are used to “improve the adhesion properties relative to pure copper.” (Col. 8, lines 36-37. Nothing even suggests grain size, increasing grain size or use of an element like Calcium (Ca) or Chromium (Cr) to increase grain size.

In the Final Office Action mailed June 26, 2006, the Examiner admitted “Edelstein et al. and Bögel et al. do not explicitly state increasing the grain size due to chromium.” (Page 6, emphasis added.) Yet, now in this Office Action, the Examiner argues that the claimed limitation of at least one element for increasing grain size including Calcium (Ca) or Chromium (Cr) is

“inherent in Edelstein et al’s device.” (Page 3.) The only support for the Examiner’s allegation that it is inherent is the Examiner’s statement “because it is known in the art that the inclusion of Calcium and Chromium (Cr) increases grain size.” Examiner makes this statement, as he has in numerous previous office actions without any evidence whatsoever!! The Examiner cites to Bögel et al as “supporting evidence that the inclusion of Calcium (Ca) or Chromium (Cr) increases grain size.” He specifically points to Bögel et al col. 7, lines 65-67, which state:

FIG. 3 graphically illustrates the effect of solution annealing (SA) time and temperature on the recrystallization and grain growth for a copper alloy having 0.40% chromium.

However, this language in Bögel et al describes change in grain growth due to *annealing time* and *temperature*, not by the addition of an element. Unlike what the Examiner suggests, Bögel et al. does not provide any support for the notion that adding Calcium (Ca) or Chromium (Cr) increases grain size. There is no causation taught or suggested that including Calcium (Ca) or Chromium (Cr) increases grain size.

Without the evidentiary support showing the claimed limitations in Applicants’ claims, the rejection of Claims 1-3, 6, 10, 15, 17-20 and 22 under 35 U.S.C. § 102(e) cannot be properly maintained. Applicants respectfully request withdrawal of the rejection.

Rejections Under 35 U.S.C. § 103

In the Office Action, Claims 8, 13, and 16 are rejected under 35 U.S.C. § 103(a) over Edelstein et al in view of Bögel et al.

Claim 4 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Edelstein et al. and Bögel et al. and further in view of U.S. Patent No. 6,440,849 (Merchant et al.).

Claims 9 and 23 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Edelstein et al. and Bögel et al. and further in view of U.S. Patent No. 6,380,083 (Gross).

Claims 11-12 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Edelstein et al. and Bögel et al. and further in view of U.S. Patent No. 6,090,710 (Andricacos et al.).

Applicants traverse all of these rejections.

To establish a prima facie case of obviousness based on a combination of prior art references under 35 U.S.C. § 103(a), the Examiner must first show that there is a suggestion or motivation to combine the teachings of those references. This may come in the form of some objective teaching in the prior art or, alternatively, knowledge generally available to one of ordinary skill in the art at the time of the invention that would lead that individual to combine the relevant teachings of the references. When the motivation to combine the teachings of the references is not immediately apparent, it is the duty of the Examiner to explain why the combination of the teachings is proper. Ex parte Skinner, 2 U.S.P.Q.2d 1788 (Bd. Pat. App. & Inter. 1986).

In the present case, there is no showing of a motivation or suggestion to one of ordinary skill in the art to combine the teachings as the Examiner has attempted to do. The combination of Edelstein et al. and Bögel et al. is not proper. A person of skill in the art would not look to Bögel et al. for the teachings missing in Edelstein et al. Bögel et al. specifically states that its invention is directed to “under the hood **automotive** applications” (Col. 4, lines 60-61, emphasis added.) There is no suggestion that such a reference would be combined with Edelstein et al., which relates to the “technology of making interconnections to provide for vias, lines, and other recesses in semiconductor chip structures” (Background of the Invention, col. 1, lines 20-22.) Bögel et al. is not within the Appellants’ field of endeavor and, further, Bögel et al. does not relate to a particular problem addressed by Appellants’ claimed invention, namely increasing electromigration properties by increasing the grain size in a via material. (See M.P.E.P. 2141.01(a).)

To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art (see M.P.E.P. § 2143.03). Claims 4, 8, 9, 11-13, 16, and 23 depend from one of claims 1, 10, and 17. As discussed above, the Examiner has not shown that all of the limitations of claims 1, 10, and 17 are taught or suggested by the combination of Edelstein et al. and Bögel et al.. None of the references teach or suggest:

depositing a copper alloy material...including...at least one element
for increasing grain size including Calcium (Ca) or Chromium (Cr),

required by Claim 1, or

the ternary copper alloy via material includes an element with a characteristic for increasing grain size of the ternary copper alloy via, required by independent Claims 10 and 17. Moreover, there is no evidence to support the Examiner's position that these teachings are "inherent."

For at least the foregoing reasons, Applicants respectfully request withdrawal of the rejections based on the combination of the above-mentioned references.

Applicants believe that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

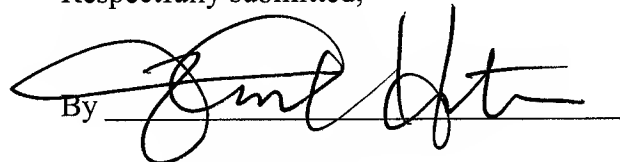
The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 50-2350. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 50-2350. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicants hereby petition for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 50-2350.

Respectfully submitted,

Date May 11, 2007

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